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Federal Communications Commission  
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FEDERAL COMMUNICATIONS COMMISSION  
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In the Matter of )

Implementation of Section 17 )

ET Docket No. 93-7

of the Cable Television )

Consumer Protection and

Competition Act of 1992 )

Cable Systems and Consumer )

Electronics Equipment )

Comments of the Cable-Consumer Electronics Compatibility

Advisory Group

This proceeding initiates a comprehensive review of issues relating to compatibility between cable television systems and consumer electronics equipment, issues that arise under Section 17 of the Cable Consumer Protection and Competition Act of 1992.<sup>1</sup> At the recommendations of the Commission and before the Commission

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1/ Pub.L. No 102-385, 106 stat. 1460 (1992) ("Cable Act").

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released its Notice of Inquiry ("Notice") (representatives of the cable and consumer electronics industries and their trade associations had formed this Advisory Group and had opened a dialogue to discuss these matters. The two industries intend to work together, and with the Commission, to try to facilitate implementation of the "compatibility" provisions of the Cable Act. Toward that end, we have collaborated on this joint response to the Notice.

We hasten to explain that the cable and consumer electronics industries, however, have distinct interests and differing points of view on several issues raised in the Notice. Individual companies and both the National Cable Television Association (NCTA) and the Electronics Industries Association/Consumer Electronics Group (EIA/CEG) are filing separate comments to set forth independent views on the subjects presented in the Notice. We nonetheless felt it would be useful to the Commission (and to the efforts of each industry to understand the other better) to formulate a joint submission, especially in response to questions seeking to elucidate factual (as opposed to analytic) answers.

These comments respond to the questions in the Notice on which the two industries have a consensus of views. The individual comments of the individual parties will address the issues on which there are divergent views.



Increasingly, cable systems are using a hybrid system made up of some portions of coaxial cable and some portions of fiber optic cable. In all cases, all of the channels delivered to subscribers on a cable system are carried and delivered to the customer as vestigial side band, amplitude modulated, radio frequency TV signals (VSB-AM, RF). (See figure 1)

In the subscriber's premises, the drop cable will be connected either directly to the customer's receiving equipment or to the input of a "set top" device. This device is provided to those customers who have one or more of the following needs:

1. the customer's TV or VCR does not tune the same number of channels (i.e., the cable system delivers more than the TV set can tune);
2. the customer has a TV or VCR that is capable of tuning the cable channels but suffers from a condition known as "direct pick-up" in which the subscriber's TV set receives over the air signals directly through its internal wiring and these signals interfere with the signals from the cable system. A set-top converter will frequently help to eliminate this condition since the output channel of the converter has been chosen so as not to duplicate an off air signal;

3. the customer's TV set does not have a remote control capability. In this case, a converter equipped with a remote control can act as an add on remote feature for the older TV; or

4. the subscriber has chosen to pay for a "premium" channel which has been secured through the use of scrambling. In this situation, the set-top device is called a converter/descrambler and performs the descrambling function so that an authorized customer can view the requested service. (see figure 2)

12.2 How many channels of service are provided on a cable and what frequencies are used for delivery of those channels? In what circumstances and to what extent are dual cable used to deliver service?

Cable system capacity varies depending on a variety of

In some circumstances, either a franchise authority demands more channels than can be accommodated on a single cable or the cable operator, in designing a system that can be upgraded to a greater number of channels in the future, will decide to use dual cables. In these circumstances, each cable has the same frequency complement and the total number of channels on the cable system is frequently split between them. Thus a dual 450 Mhz system could conceivably carry 2 cables x 54 channels or 108 total channels. There are probably less than a dozen dual cable systems in the U.S. and they serve less than 5% of all subscribers.

The channel assignment of frequencies that is used by the cable industry is the "IS 6" plan. This is a interim standard channel plan that was jointly developed by the EIA and the NCTA to standardize channels so that TVs and VCRs would have the same channel scheme as cable operators. (see attachment #1)

12.3        What methods and technologies do cable systems use to prevent theft and unauthorized reception of service (the various scrambling and encryption systems, converter and/or descrambler units, interfering carrier systems, channel-blocking, traps, addressable systems, interdiction systems, etc.)? What are the operating principles used in each of these approaches?

The cable industry uses three general methods of preventing

theft and unauthorized reception of service. These are scrambling, trapping, and interdiction type systems.

In the scrambling systems, the subject signal is altered at the headend to make it unreceivable by standard television receivers.

In order to restore the channel to a viewable condition, a set-top descrambler would be supplied to the customer that corrects the parts of the signal that have been altered. The output of such a set-top is a single RF channel chosen to be the same as a locally non-used over-the-air frequency. This output channel is then delivered to the consumer's TV or VCR. Descramblers can either be fixed (designed to descramble a specific channel and supplied when requested by the customer) or they can be addressable (an electronic signal can be sent from the headend to a specific customer's set-top descrambler to authorize or de-authorize service as required.)

In trapping, the cable industry uses two basic types of traps. One is a negative trap. This is a filter that removes a specific frequency from a band of frequencies. In the use of negative trapping, customer's who do not wish to subscribe to a specific service would have a trap installed at the subscribe tap-off which feeds signals to the customer's drop cable. This would allow the passage of all channels except the protected service. All other services would pass through and be received by the

customer in the clear. Negative traps are usually only used where the penetration of a service is high since the negative trap is only needed where specific customers do not subscribe to the protected service.

Positive traps, unlike the negative version, use an interfering carrier that is placed on top of a specific channel at the headend. This interfering carrier prevents proper reception of the signal by the home consumer's TV set or VCR. If a subscriber wishes to accept that particular service, a filter is provided which removes only the interfering carrier. This filter is frequently installed inside the home immediately before the television set or VCR.

The third type of security system is an interdiction system. In this technique, signals are carried in the clear on the trunk and feeder plant. At the junction between the customer drop and the cable distribution plant, a device is installed which can produce

an interfering carrier on any specific frequency that is desired.

This device is addressable (specific interfering carriers may be turned on and off by an electronic signal from the headend). The channels which are not desired by the subscriber are interdicted and thus not viewable by the customer. All other channels enter the home in the clear.

12.4       What proportion of cable systems (and the number and proportion of subscribers affect) use each of the available security methods and technologies? How many systems use converter units, for either security or other purposes, such as elimination of direct pick-up interference in receivers, and how many and what percentage of subscribers on those systems are using converters?

Converter units are no longer used for security. The original patent on converters (see the Mandell patent, attachment 2) was designed to correct certain operating problems of TV sets. The bulk of the descriptive passages in the patent refer to this use of the device. In the early days of the use of converters, the cable industry also used them as a security device since no consumer TVs could tune cable channels that were different than the broadcast channels. With the later introduction of "cable ready" TVs, the use of converters as a security option ceased.

As to current usage, it is estimated that there are approximately 15 million of these devices in use. Some percentage of these are used to enhance the tuning range of consumers' TV receivers and some percentage is used to solve specific problems such as direct pick-up. There is no way to get a hard fix on exactly how many are used for what purpose but virtually all converters are used for one purpose or the other.

It is very difficult to get a precise answer as to the proportion of cable systems and the proportion of subscribers

affected using each of the available security methods and technologies. However some assumptions, can be made. For the pay-per-view subscribers (approximately 25 million) an addressable descrambler is used. As to how many of the premium services are also authorized through an addressable descrambler, it is quite hard to say since most systems that carry premium services use a variety of techniques including positive and negative trapping as well as scrambling with addressability. Only a very small number of systems use interdiction and they serve less than 80,000 subscribers.

12.5        What are the costs of the existing alternative techniques  
for preventing theft, unauthorized reception, and addressable

addressable and must be manually added or removed, the cost of changing service levels at a customer with traps is the cost of a truck roll, which is approximately \$30 - \$50.

Interdiction costs are similar to addressability costs with the "port" near the customer's home taking the place of the capital investment in the set-top descrambler. Currently the cost of that port is somewhat higher than a traditional set-top box.

12.6       What is the effect of channelization practices and security systems on the operation of extended features of television receivers, video cassette recorders and other related consumer television equipment? How does use of these techniques affect the technical performance and operations of cable systems?

In the case of trapping, both positive and negative, clear signals are delivered into the consumer's home so there is no effect on the operation of extended features of television sets and VCRS. This is also true of interdiction systems. In the case of scrambling, however, only the signals that are delivered in the clear can be utilized by the features in TVs and VCRS. Scrambled pictures must first be restored before they can be used. Since the output of a commonly used set-top converter or descrambler is a single channel, features such as "watch one channel while recording another" or "picture-in-picture" cannot be used. There are set-top boxes, however, for descrambling purposes that have alternative capabilities that can ameliorate some of these issues. These devices include descramblers that also have an RF by-pass which

allows the signals that do not need to be descrambled to be passed directly to the subscribers TV or VCR. Other converters or descramblers also may have a programmable timer similar to the one in the VCR. This enhancement allows the subscriber to tape programs in different time periods and on different cable channels. There are also set top devices that contain two descrambler circuits.

These can be used to allow the subscriber to "watch one scrambled program while recording a different one".

The primary impact of the different techniques on the cable system has to do with the economics and maintenance considerations for the cable system.

Traps have a certain amount of insertion loss and, if a cable system wishes to provide a variety of pay services while using traps, it is possible that a series of traps could cause the cable operator to fail to meet certain parameters in the FCC technical performance regulations (part 76.605). Further, traps require manual installation and de-installation which are labor intensive. In the case of scrambling with addressability, truck rolls are kept to a minimum but the high cost of the set-top places an economic burden on the cable system in the form of capital investment. Also, being an electronic device of some complexity the maintenance of set-tops extracts a cost as well.

Whereas in the case of scrambling and subsequent descrambling, the cost of the box is borne by the subscriber that wishes to take the protected service, in the case of interdiction this is not the

case. The costs are imposed on all subscribers.

As regards channelization, the maximum defined channel count is 125 (per IS 6), however, there is one cable company with 150 channels (Queens, Time Warner) with one other 150 channel system under construction (Viacom's Castro Valley). It is not clear whether these activities constitute a definite trend.

Another consideration is channel mapping. Some cable companies provide set top boxes with hard-wired mapping of frequency to channel number which is not standardized per IS.6 In order to allow TVs and VCRs to incorporate channel mapping for all cable system assignments schemes, the mapping assignments must be down loadable from the cable headend. A standardized protocol to affect this necessary. The Extended Data Service developed in the EIA Television Data Services Subcommittee will allow the closed caption decoder (which is required in all TV's 13" and over) to support such a function and bears further investigation.

12.7 Which methods of scrambling and encryption do not interfere with the functions of subscribers' TV receivers, VCRs and other TV equipment?

"Point of entry" is a technique for packaging other signal protection methods. "Point of entry" is installed outside the subscriber's home, transmitting all authorized signals into the home "in the clear". Examples of techniques used in "Point of Entry" systems are: traps, Zenith Shadow, and interdiction. A

proposed security technique known as multichannel descrambling is intended to be used in a "Point of Entry" circumstance if it becomes commercially viable.

12.8        What types of cable converters are currently available to cable subscribers commercially from third parties?

The only types of devices that can be used on cable systems that are available commercially from third parties for cable subscribers are converters. De-scramblers may not be legally provided to cable subscribers from third parties without the permission of the cable operator. Plain converters can be useful in a variety of ways for the subscriber, as listed at 12.1 . They also may be used in situations where the cable operator offers a discount to customers who do not use the cable system supplied converter.

12.9        To what extent do cable systems currently make converters and/or remote control units available for purchase by their subscribers?

Currently converters and/or remote controls are not generally available for purchase by subscribers from cable systems. However, some cable operators do offer them for sale.

12.10       To what extent is it technically and economically

feasible for cable systems to offer subscribers the option of delivering directly to subscribers receivers or VCRs all signals that do not need to pass through a converter?

While it is technically feasible to offer home subscribers the option of delivering certain signals directly to receivers and VCRs in a situation where a set-top would normally be required, it is complex and costly. (see attachments #3) There are some versions of converters that have an RF bypass built into them that would accomplish this at a small additional cost and would not require any great technical effort on the part of the cable operator. Also see Question 12.7.

12.11 To what extent are cable converters or other devices used by cable systems to resolve technical problems such as signal leakage?

If TVs or VCRs have inadequate shielding, they become leakage sources. The only method available to cable operators to deal with this situation is to place a converter ahead of the leaky device. A converter, with superior shielding, limits the re-radiation of the cable spectrum. The output of the converter is on an unused over the air channel and causes no harm if it should leak from the TV or VCR. Since converters also serve other useful functions, it is difficult to determine how many are specifically used to contain leakage.

13.           CONSUMER EQUIPMENT FEATURES

13.1           What types and portions of currently available consumer TV equipment include [features which are affected by the manner of cable signal delivery]?

          All television receivers and video cassette recorder decks which employ a tuner are affected by the manner of cable signal delivery. Specific features which may be affected include:

- \*     Remote control operation
- \*     Picture-in-Picture
- \*     On Screen Display channel labeling
- \*     Channel Guide (matrix of several frequently updated still-frame pictures sampling each channel in the channels scan list).
- \*     Viewing and recording programs simultaneously
- \*     Channel selection
- \*     VCR timer recorder

13.2           How are these features affected by the various methods of cable signal delivery, particularly with respect to techniques and methods cable operators use to protect against theft of service?

          Generally any security system which requires a separate set-top box will impact various features such as:

          picture in picture  
          record while watching

sequential programming of events  
on different channels

Remote controls which are supplied with the consumer equipment

will not be useful for changing channels

(channel guides etc.)

- \* Picture outside Picture (on 16:9 TVs)
- \* Channel scan (Picture outside Picture)
- \* Other proprietary features for 16:9 sets

13.6        How many channels should a device be able to receive, and in what frequency ranges should those channels be, in order to be considered cable ready or cable compatible? What other cable system operating characteristics should a device be able to accommodate to be considered cable compatible?

A joint task force of the Advisory Group is working towards specifications that would define a cable compatible receiver. We hope to reach a decision in the reasonably foreseeable future, and the Advisory Group will report to the Commission at the conclusion of its efforts. The task force is also working on whatever complementary specifications are necessary to define the requirements for cable equipment and operations.

#### 14.    REGULATORY PROGRAM FOR ASSURING COMPATIBILITY

14.2        What new methods for providing cable system security are being developed, when will they be available and how much would they cost (to both consumers and cable subscribers)?

The only new methods that are being developed for the cable security efforts are interdiction and broadband descrambling. In the case of interdiction, the technology is commercially available now. The cost to deploy this system varies depending on the number of channels that must be controlled but, in general, costs more than traditional descrambling. As for broadband descrambling, the system is not available at this time. When this will be ready for the cable market will depend on further research and development by the proponent.

14.3        How will new digital transmission techniques affect system security, including costs?

The use of digital transmission should permit a high degree of security to be achieved. It is essential that a single standard be adopted for digital compression and transmission. If multiple standards are allowed to exist, it may not be possible to achieve a cost effective, consumer friendly environment.

14.7        To what extent, if any, should cable systems be restricted in the manner in which they encrypt or scramble their signals?

The scrambling technique used should be such that no pre-scrambled information is lost or signal quality compromised. (e.g.

closed captioning).

For present analog NTSC signals, there should be no restrictions for transmission within the cable plant, but all authorized signals delivered into a subscribers TV or VCR should be in clear NTSC format.

12-10 Should shielding requirements be provided for all signals?

provisions of section 3 of the 1992 Cable Act?

Any requirement to un-bundle channels within tiers to permit a-la-carte purchase of channels will encourage further installation of addressable converter/descramblers, exacerbating consumer product compatibility issues.

16. REMOTE CONTROL PROVISIONS

16.1 What types of remote control equipment currently are used by cable systems?

Most set-top boxes that are supplied to a subscriber by the cable operator will be equipped with a remote control. Many of these remotes are also designed to be "universal" and thus can be programmed to operate other consumer devices such as a TV or VCR.

16.2 To what extent is the same model of converter units provided to subscribers for both manual and remote control use?

Converter models (as well as descrambler set) are usually available from the manufacturer as either a remote or non-remote control product. The unit itself is usually remote operation capable.

16.3 To what extent do cable operators use technical systems



years.

16.6 To what extent are the remote control features of cable converters compatible with existing commercially available remote control units, including the "universal" remote control design?

In addition to the remote controls specifically designed for a particular cable converter/descrambler, so called "universal" remotes can be programmed or taught to work any set-top device.

16.7 What types of such units are available and how much do they cost?

There are basically three types of remote control available in the marketplace. The first is a unit that is specifically designed to work only a particular device or set of devices. The second type, often is called a "multibrand" remote, can be programmed either by the use of internal "dip" switches or by entering codes on the key pad. The third type is the learning remote. This type of unit can be programmed to emulate any other remote control devices by placing the two units "head to head" and pressing the appropriate buttons.

Aftermarket remotes range from \$12.95 to \$99.95 at retail, but most sales fall in the \$15 to \$30 range.

16.8        What portion of the market currently owns such units?

While specific penetration statistics are not known, the market for replacement TV and VCR remote control units has been estimated at 5-8 million per year, and virtually all of those are capable of operating set-top boxes. In addition millions of new TVs and VCRs sold every year are equipped with remotes which are also capable of operating with set-top boxes.

16.9        How can the Commission best encourage the commercial availability of remote control units that are compatible with existing converter units?

The remote control units are already currently available from a wide variety of sources.

17.5        How might prospects for new remote control devices providing access to program types rather than channel numbers, affect, or be affected by, this proceeding?

### Conclusion

We hope that the information and summaries of positions set forth above will be of value to the Commission as it begins to

evaluate the many complex issues raised in the Notice. We further hope that our efforts to work together will result in increased mutual understanding between the industries and facilitate the development of consensus on the measures needed to ensure proper implementation of Section 17 of the Cable Act.